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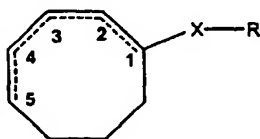
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(54) Title: CYCLOOCT-(EN-)YL DERIVATIVES FOR USE AS FRAGRANCES



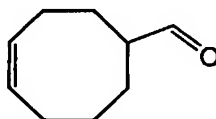
(I)

(57) Abstract: This invention relates to substituted cyclooctenes of formula (I), wherein X and R are defined in the specification.

## CYCLOOCT-(EN-)YL DERIVATIVES FOR USE AS FRAGRANCES

This invention relates to substituted cyclooctenes having agrestic, natural, and floral, green, woody odour notes, their manufacture, and to fragrance compositions containing them.

Substituted cyclooctenes have been described in the literature, for example, the German patent publication DE 19814913 A1 discloses cyclooctene aldehydes, such as cyclooct-4-en aldehyde (1) possessing an odour note described to be comparable with the odour of fresh harvested potatoes.



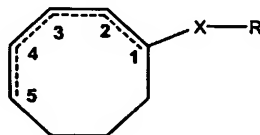
(1)

Whereas the odour notes imparted by cyclooct-4-en aldehyde (1) may be interesting in their own right, in the fragrance industry, there is always an ongoing demand for new compounds that enhance or improve on odour notes, or impart new odour notes.

Surprisingly, we have now found certain monosubstituted cyclooctenes structurally similar to (1), but which possess characteristically different odour notes which are described as agrestic and thujone-like, and floral, green, woody odour notes.

20

In a first aspect, the invention refers to the use of a compound of formula I as fragrance,



I

wherein X is carbonyl, or -(CHOH)- ; and  
R is methyl or ethyl, or linear or branched C<sub>3</sub> to C<sub>5</sub> alkyl, such as *i*-propyl, *n*-propyl, *n*-butyl, *sec*-butyl, *tert*-butyl, *n*-pentyl, *sec*-pentyl, and *tert*-pentyl; or  
R is vinyl, or linear or branched C<sub>3</sub> to C<sub>5</sub> alkenyl, such as propen-1-yl, propen-2-yl, allyl, but-1-en-1-yl, but-2-en-1-yl, but-3-en-1-yl, and pentenyl; and  
the dotted line represents one optional double bond.

The compounds according to the present invention may contain one or more chiral centres and as such may exist as a mixture of stereoisomers, or they may be resolved as isomerically pure forms. Resolving stereoisomers adds to the complexity of manufacture and purification of these compounds and so it is preferred to use the compounds as mixtures of their stereoisomers simply for economic reasons. However, if it is desired to prepare individual stereoisomers, this may be achieved according to methodology known in the art, e.g. preparative HPLC and GC or by stereoselective syntheses.

Preferred compounds of formula I are 1-cyclooct-3-enylethanone, 1-cyclooct-3-enylpropan-1-one, 1-cyclooct-3-enyl-2-methylpropan-1-one, 1-cyclooct-3-enylpropan-1-ol, 1-cyclooct-4-enylethanone, 1-cyclooct-2-enylethanone, 1-cyclooct-2-enylethanol, 1-cyclooct-1-enylethanone, 1-cyclooctylpropanone, 1-cyclooctyl-2-methylpropanone, and 1-cyclooctyl-2-methylpropanol.

Particularly preferred are compounds of formula I having a double bond at position C-3, i.e. a compound of formula I wherein the bond between C-3 and C-4 together with the dotted line represents a double bond, and the bonds between C-1 and C-2, C-2 and C-3, and C-4 and C-5 represent each a single bond, such as 1-cyclooct-3-enylethanone, 1-cyclooct-3-enylpropan-1-one, 1-cyclooct-3-enyl-2-methylpropan-1-one and 1-cyclooct-3-enylpropan-1-ol.

As used in relation to compounds of formula I "one optional double bond" refers to compounds of formula I wherein the bond between C-1 and C-2 together with the dotted line represents a double bond, and the bonds between C-2 and C-3, C-3 and C-4, and C-4 and C-5 represent each a single bond; or the bond between C-2 and C-3 together with the dotted line represents a double bond, and the bonds between C-1 and C-2, C-3 and C-4, and C-4 and C-5 represent each a single bond; or the bond between C-3 and C-4 together with the dotted line represents a double bond, and the bonds between C-1 and C-2, C-2 and C-3, and C-4 and C-5 represent each a single bond; or the bond between C-4 and C-5 together with the dotted line represents a double bond, and the bonds between C-1 and C-2, C-2 and C-3, and C-3 and C-4 represent each a

single bond; or the bonds between C-1 and C-2, C-2 and C-3, C-3 and C-4, and C-4 and C-5 represent each a single bond.

The compounds according to the present invention may be used alone or in  
5 combination with known odourant molecules selected from the extensive range of natural products and synthetic molecules currently available, such as essential oils, alcohols, aldehydes and ketones, ethers and acetals, esters and lactones, macrocycles and heterocycles, and/or in admixture with one or more ingredients or excipients conventionally used in conjunction with odourants in fragrance compositions, for  
10 example, carrier materials, and other auxiliary agents commonly used in the art.

The following list comprises examples of known odourant molecules, which may be combined with the compounds of the present invention:

15 natural products: tree moss absolute, basil oil, tropical fruit oils (such as bergamot oil, mandarin oil, etc.), mastix absolute, myrtle oil, palmarosa oil, patchouli oil, petitgrain oil, wormwood oil, lavender oil, rose oil, jasmin oil, ylang-ylang oil.

alcohols: farnesol, geraniol, linalool, nerol, phenylethyl alcohol, rhodinol, cinnamic  
20 alcohol, (Z)-hex-3-en-1-ol, menthol,  $\alpha$ -terpineol.

aldehydes: citral,  $\alpha$ -hexyl cinnamaldehyde, Lilial, methylionone, verbenone, nootkatone, geranylacetone.

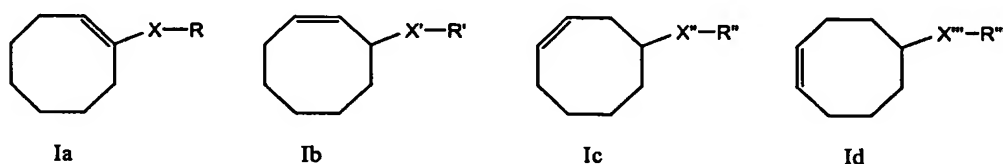
25 esters: allyl phenoxyacetate, benzyl salicylate, cinnamyl propionate, citronellyl acetate, decyl acetate, dimethylbenzylcarbonyl acetate, dimethylbenzylcarbonyl butyrate, ethyl acetoacetate, cis-3-hexenyl isobutyrate, cis-3-hexenyl salicylate, linalyl acetate, methyl dihydrojasmonate, styrallyl propionate, vetiveryl acetate, benzyl acetate, geranyl acetate.

30 lactones:  $\gamma$ -undecalactone,  $\delta$ -decalactone, pentadecanolide, 12-oxahexadecanolide.

acetals: Viridine (phenylacetaldehyde dimethylacetal).

other components often used in perfumery: indole, p-mentha-8-thiol-3-one, methyleugenol, eugenol, anethol.

Whereas a single compound of formula I enhances, or improves on odour notes in their own right, it was found that a mixture of double bond isomers enhances the diffusion of a fragrance even more. Thus, the present invention refers in a further aspect to a fragrance composition comprising a mixture of A) a compound of formula Ic; and B) at least one compound selected from a compound of formula Ia, a compound of formula Ib, and a compound of formula Id



wherein X and R have the same meaning as defined above and  $R = R' = R'' = R'''$  and  $X = X' = X'' = X'''$ .

Particularly preferred are mixtures comprising a compound of formula Ia, a compound of formula Ic, and a compound of formula Id. Preferred mixtures are those comprising at least 50% by weight of a compound of formula Ic based on the total weight of all double bond isomers, i.e. amount of the compound of formula Ia + Ib + Ic + Id = 100% by weight.

The compounds of the present invention may be used in a broad range of fragrance applications, e.g. in any field of fine and functional perfumery. The compounds can be employed in wide ranging amounts depending upon the specific application and on the nature and quantity of other odourant ingredients, that may be for example, from about 0.001 to about 20 weight percent of the application. In one embodiment, compounds may be employed in a fabric softener in an amount of about 0.001 to 0.05 weight percent. In another embodiment, compounds of the present invention may be used in an alcoholic solution in amounts of about 0.1 to 20 weight percent, more preferably between about 0.1 and 5 weight percent. However, these values should not be regarded as limiting the present invention, since the experienced perfumer may also achieve effects or may create novel accords with lower or higher concentrations.

The compounds of the present invention may be employed into the fragrance application simply by direct mixing the compound of the present invention or the fragrance composition comprising the compound with the fragrance application.

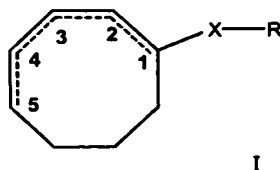
5 Alternatively, they may be added in an entrapped form, by being in a previous step entrapped with an entrapment material, for example polymers, capsules, microcapsules and nanocapsules, liposomes, precursors, film formers, absorbents, for example by using carbon or zeolites, cyclic oligosaccharides and mixtures thereof, and then mixed with the application.

10

Thus, the invention additionally provides a method of manufacturing a fragrance application, comprising the incorporation of a compound of formula I as a fragrance ingredient, either by directly admixing the compound of formula I into the application or by admixing a fragrance composition comprising a compound of formula I, which may  
15 then be mixed to a fragrance application, using conventional techniques and methods.

As used herein, "fragrance application" means any product, such as fine perfumery, e.g. perfume and Eau de Toilette; household products, e.g. detergents for dishwasher, surface cleaner; laundry products, e.g. softener, bleach, detergent; body care products,  
20 e.g. shampoo, shower gel; and cosmetics, e.g. deodorant, vanishing creme, comprising an odourant. This list of products is given by way of illustration and is not to be regarded as being in any way limiting.

Whereas some compounds have been described in the literature, others have not, and  
25 are novel. Thus, in another aspect of the invention, there is provided a compound of formula I



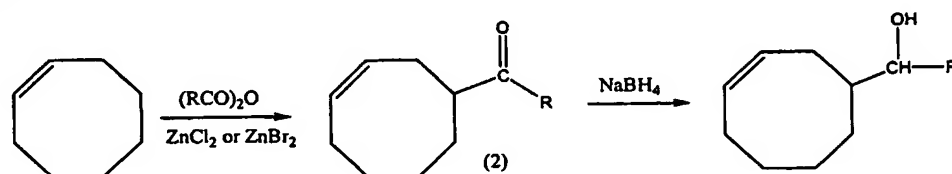
wherein X is carbonyl, or -(CHOH)- ; and  
30 R is methyl or ethyl, or linear or branched C<sub>3</sub> to C<sub>5</sub> alkyl, such as *i*-propyl, *n*-propyl, *n*-butyl, *sec*-butyl, *tert*-butyl, *n*-pentyl, *sec*-pentyl, and *tert*-pentyl; or

R is vinyl or linear or branched C<sub>3</sub> to C<sub>5</sub> alkenyl, such as propen-1-yl, propen-2-yl, allyl, but-1-en-1-yl, but-2-en-1-yl, but-3-en-1-yl, and pentenyl; and the dotted line represents one optional double bond; provided that

- 5 when X is carbonyl and one of the bonds between C-1 and C-2, C-2 and C-3, and C-3 and C-4 together with the dotted line is a double bond, R is not methyl or ethyl;
- when X is carbonyl and the bond between C-2 and C-3 together with the dotted line is a double bond, R is not *i*-propyl;
- when X is carbonyl and the bond between C-3 and C-4 together with the dotted line is a double bond, R is not methyl or ethyl;
- 10 when X is carbonyl and all of the bonds between C-1 and C-2, C-2 and C-3, C-3 and C-4, and C-4 and C-5 together with the dotted line represent each a single bond, R is not methyl or ethyl;
- when X is -(CHOH)-, R is not methyl; and
- 15 when X is -(CHOH)- and the bond between C-2 and C-3 together with the dotted line is a double bond, R is not ethyl.

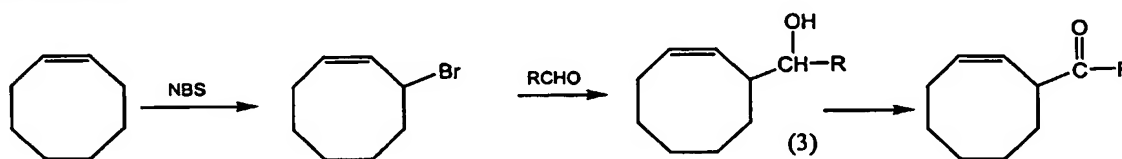
Compounds of formula I, wherein the bond between C-3 and C-4 together with the dotted line represents a double bond, i.e. substituted cyclooct-3-enes, may be prepared by the reaction of olefins with an appropriately substituted carboxylic acid, well known to a person skilled in the art and described for example by Schellhammer (Methoden der Organischen Chemie (Houben-Weyl), 1973, Band VII/2a, pages 447 – 460) herein incorporated by reference, starting from cyclooctene by acylation with the appropriately substituted carboxylic acid. The resulting ketones (2) may be reduced to give further compounds of formula I as shown in scheme 1.

Scheme 1:



Compounds of formula I, wherein the bond between C-2 and C-3 together with the dotted line represents a double bond, i.e. substituted cyclooct-2-enes, may be prepared by selective bromination of cyclooctene, resulting in 3-bromo-cyclooctene, followed by addition of the appropriate aldehyde R-CHO under Grignard type reaction conditions known to the person skilled in the art. The resulting alcohols (3) may be oxidised to give further compounds of formula I as shown in scheme 2.

Scheme 2:



Compounds of formula I wherein the bond between C-4 and C-5 together with the dotted line represents a double bond, i.e. substituted cyclooct-4-enes, may be prepared by selective bromination under acidic conditions starting from cycloocta-1,5-diene, resulting in 5-bromo-cyclooctene, followed by addition of the appropriate aldehyde under Grignard conditions, resulting in an alcohol which may be oxidised to give further compounds of formula I.

Compounds of formula I wherein the bond between C-1 and C-2 together with the dotted line represents a double bond, i.e. substituted cyclooct-1-enes, may be prepared by the reaction of the appropriate alkynes with cyclooctanone under alkaline conditions, followed by Rupe rearrangement under acidic conditions.

Alternatively, a double bond isomeric mixture of compounds of formula I, i.e. a mixture of substituted cyclooct-1-enes, -3-enes and -4-enes, may be prepared by addition of an alkanolic acid chloride to cyclooctene followed by dehydrochlorination of the resulting chloro-cyclooctyl alkanone under conditions known to the person skilled in the art.

Further particulars as to reaction conditions are provided in the examples.

There now follows a series of non-limiting examples that illustrate the invention.



Example 1: 1-cyclooct-3-enylethanone

To cyclooctene (300 g, 2.73 mol) were added acetic anhydride (556 g, 5.45 mol) and zinc chloride (30 g, 0.22 mol). The reaction mixture was warmed to 90-95°C within 30 min., stirred at that temperature during 7.5 hours, cooled to 60°C, and treated with  
5 caution, within 10 min., with water (400 ml). The resulting mixture was heated at 100°C during 3 h., cooled to 25°C, and extracted with hexane (3 x 300 ml). The combined organic phases were washed with aq. sat. NaCl soln. (800 ml), aq. sat. NaHCO<sub>3</sub> soln. (800 ml), aq. sat. NaCl soln. (400 ml), and dried (Na<sub>2</sub>SO<sub>4</sub>). Evaporation of the solvent led to 375 g of crude material which was distilled under vacuum with a short-path  
10 Vigreux column. After collecting the unreacted cyclooctene (65 g, 21.7%) at 40-50°C/100 mbar, the fractions distilling at 110°C/24 mbar were collected (144 g) and redistilled using a microdistillation column (20 x 1.5 cm, filled with 3 x 3 mm rolled wire netting) to give 110 g of 1-cyclooct-3-enylethanone (34% based on the reacted cyclooctene, 109°C/20 mbar) as colourless oil.

15 <sup>1</sup>H-NMR (400MHz, CDCl<sub>3</sub>):  $\delta$  1.40-1.85 (*m*, 6H), 2.05-2.16 (*m*, 1H), 2.16 (*s*, Me), 2.16-2.30 (*m*, 2H), 2.38-2.47 (*m*, H-C(2)), 2.49-2.57 (*m*, H-C(1)), 5.60 (*dd*, *J* = 8.2, 18.5, H-C(3)), 5.73 (*dd*, *J* = 8.0, 18.3, H-C(4)). <sup>13</sup>C-NMR (100MHz, CDCl<sub>3</sub>):  $\delta$  24.19 (*t*, C(7)), 25.58 (*t*, C(5)), 26.13 (*t*, C(2)), 27.12 (*t*, C(8)), 28.08 (*q*, Me), 28.96 (*t*, C(6)), 52.66 (*d*, C(1)), 127.38 (*d*, C(3)), 131.48 (*d*, C(4)), 211.20 (*s*, CO). MS (EI): 152 (15), 137 (7), 134 (15), 119 (10), 109 (35), 94 (21), 79 (36), 67 (100), 55 (37), 43 (100). IR:  $\nu_{max}$  3016, 2927, 2855, 1708, 1666, 1466, 1467, 1352, 1241, 1165, 1120, 959, 755, 706 cm<sup>-1</sup>.

Odour description: agrestic, armoise, wormwood, thujone, natural.

Example 2: 1-cyclooct-3-enylpropan-1-one

Obtained according to the experimental procedure of Example 1 from cyclooctene (150 g, 1.36 mol), propionic anhydride (354 g, 2.72 mol) and zinc bromide (30.6 g, 0.14 mol) in 27% yield. Boiling point 60°C/80 mbar.

30 <sup>1</sup>H-NMR (400MHz, CDCl<sub>3</sub>):  $\delta$  1.04 (*t*, *J* = 7.3, Me), 1.40-1.80 (*m*, 6H), 2.03-2.12 (*m*, 1H), 2.17-2.27 (*m*, 2H), 2.39-2.58 (*m*, H-C(2), CH<sub>2</sub>CO, H-C(1)), 5.60 (*dd*, *J* = 8.1, 18.5, H-C(3)), 5.73 (*dd*, *J* = 8.4, 18.4, H-C(4)). MS (EI): 166 (18), 137 (16), 109 (41), 94 (19), 79

(25), 67 (100), 57 (83), 41 (34), 29 (39). IR:  $\nu_{\max}$  3017, 2928, 2855, 1708, 1669, 1464, 1413, 1375, 1115, 973, 754, 705  $\text{cm}^{-1}$ .

Odour description: fruity, banana, tagete.

5

Example 3: 1-cyclooct-3-enyl-2-methylpropan-1-one

Obtained according to the synthetic procedure of Example 1 from cyclooctene (150 g, 1.36 mol), isobutyric anhydride (430.3 g, 2.72 mol) and zinc bromide (30.6 g, 0.14 mol) in 33% yield. Boiling point 85°C/80 mbar).

10

$^1\text{H-NMR}$  (400MHz,  $\text{CDCl}_3$ ):  $\delta$  1.08 (t,  $J = 7.0$ , Me), 1.39-1.78 (m, 6H), 2.02-2.29 (m, 3H), 2.42 (dt,  $J = 8.8$ , 13.6, H-C(2)), 2.62-2.70 (m, H-C(1)), 2.79 (h,  $J = 6.9$ , H-CMe<sub>2</sub>), 5.60 (dd,  $J = 8.4$ , 18.4, H-C(3)), 5.74 (dd,  $J = 8.0$ , 18.4, H-C(4)). MS (EI): 180 (17), 165 (1), 137 (21), 119 (6), 109 (59), 94 (9), 81 (13), 79 (14), 71 (32), 67 (100), 55 (29), 53 (10), 43 (63), 39 (20), 27 (14). IR:  $\nu_{\max}$  3017, 2967, 2928, 2857, 1701, 1666, 1466, 1382, 1051, 1004, 756, 735  $\text{cm}^{-1}$ .

15

Odour description: fruity, green.

20 Example 4: 1-cyclooct-3-enylpropan-1-ol

1-cyclooct-3-enylpropan-1-one (84.0 g, 0.5 mol) was slowly added to a solution of sodium borohydride (11.9 g, 0.3 mol) in ethanol (330 ml) at 0°C (ice bath), and stirring was continued at room temperature for 4 h. The reaction mixture was poured into ice-cold 2N HCl (500 ml) and extracted with MTBE (2 x 200ml). After washing with brine (3 x 200 ml), drying ( $\text{MgSO}_4$ ) and evaporation of solvents, the yellowish oily residue (86.6 g) was distilled over a 20 cm Widmer column (66-80°C/0.7-0.8 mbar) to give 69.2 g of 1-cyclooct-3-enylpropan-1-ol (colourless oil, 68% yield). It consisted of >90% of a 1:1 mixture of two diastereomeric racemates of 1-cyclooct-3-enylpropan-1-ol. An analytical sample was purified by flash chromatography (hexane/MTBE 3:1).

25

30

$R_f$  0.51.  $^1\text{H-NMR}$  (200MHz,  $\text{CDCl}_3$ ):  $\delta$  0.95 and 0.97 (2t,  $J = 7.4$  and 7.3, 3H), 1.22-1.76 (m, 10H), 2.02-2.27 (m, 4H), 3.32-3.46 (m, 1H), 5.54-5.70 (m, 2H).  $^{13}\text{C-NMR}$ : diast. rac. A:  $\delta$  10.1 (q), 24.6 (t), 25.4 (t), 26.4 (t), 27.1 (t), 28.5 (t), 29.1 (t), 45.2 (d), 77.1 (d), 128.9 (d), 130.4 (d); diast. rac. B:  $\delta$  10.2 (q), 24.2 (t), 25.3 (t), 26.8 (t), 26.9 (t), 27.8 (t), 28.9

(t), 45.2 (d), 77.1 (d), 128.9 (d), 130.3 (d). MS (EI): 168 ( $M^+$ , 2), 150(16), 139(16), 121(76), 109(25), 107(26), 93(31), 82(28), 81(35), 79(49), 67(100), 59(50), 57(41), 55(43), 41(55). IR (neat):  $\nu_{max}$  3359, 2925, 2856, 1466, 1106, 968, 755, 705  $cm^{-1}$ .

- 5 Odour description: cassie, mimosa, green, moss, natural, forest, fatty

Example 5: 1-Cyclooct-4-enylethanone

A solution of 5-bromo-cyclooctene (5 g, 26 mmol; prepared by treatment of 1,5-cyclooctadiene with HBr in AcOH) in diethyl ether was added to magnesium (0.7 g, 29  
10 mmol, 1.1 eq.). The resulting solution was cooled to 5°C and treated dropwise with a solution of acetaldehyde (5 ml, 89 mmol, 3.4 eq.) in diethyl ether (10 ml). The resulting mixture was stirred 3 h at 20°C, treated with 2M HCl, and extracted with diethyl ether. The organic phases were washed successively with NaHCO<sub>3</sub>, NH<sub>4</sub>Cl and NaCl solutions, and dried (Na<sub>2</sub>SO<sub>4</sub>) and the solvent evaporated under vacuum. The crude  
15 product was purified by flash chromatography (hexane/Et<sub>2</sub>O 10:1) to give 1.2 g of 1-cyclooct-4-enylethanone (30%).

<sup>13</sup>C-NMR (100MHz, CDCl<sub>3</sub>):  $\delta$  24.18 (t), 25.79 (t), 27.87 (q), 27.99 (t), 28.16 (t), 30.53 (t), 51.58 (d, C(1)), 129.65 (d), 130.53 (d), 212.28 (s).

20 MS (EI): 152 (1), 137 (7), 134 (30), 119 (14), 109 (27), 105 (7), 94 (14), 79 (34), 67 (77), 55 (28), 43 (100), 39 (31).

Odour description: green leaves, thuja oil, armoise, fruity.

25 Example 6: 1-Cyclooct-2-enylethanol and 1-cyclooct-2-enylethanone

At -50°C, a solution of 3-bromo-cyclooctene (4.2 g, 22 mmol; prepared by reaction of cyclooctene with N-bromosuccinimide) and titanium(IV)isopropoxide (7.2 ml, 24 mmol, 1.1 eq.) in diethyl ether (100 ml) was treated with a 2M solution of isopropylmagnesium chloride in diethyl ether (49 mmol, 2.2 eq.). The resulting mixture was stirred 1.5 h at  
30 -50°C, treated with acetaldehyde (1 ml, 18 mmol, 0.8 eq.), stirred 1 h at -40°C, and treated with 2M aqueous HCl solution. After extraction with MTBE (2 x 100 ml), washing of the organic phases with water (2 x 200 ml) and aqueous NaCl solution (200 ml), and drying (MgSO<sub>4</sub>), the crude product (4.4 g) was purified by flash chromatography (hexane/MTBE 6:1) to give 0.7 g of 1-cyclooct-2-enylethanol (26%).

$^{13}\text{C}$ -NMR (100MHz,  $\text{CDCl}_3$ ):  $\delta$  21.27 (q), 25.51 (t), 26.64 (t), 26.82 (t), 29.38 (t), 31.78 (t), 43.83 (d), 71.44 (d, CHOH), 130.43 (d), 130.54 (d). MS (EI): 154 (1), 136 (1), 121 (2), 110 (48), 95 (25), 82 (100), 67 (93), 54 (35), 45 (65), 41 (43).

5 Odour description: green, earthy, fruity, fresh

At 0°C, a solution of 1-cyclooct-2-enylethanol (1.4 g, 9 mmol) in dichloromethane (20 ml) was added to pyridiniumchlorochromate (2.35 g, 11 mmol) in dichloromethane (30 ml). The resulting mixture was stirred at 20°C during 3.5 h and filtered through Celite®. The filtrate was concentrated and the crude product purified by flash chromatography (hexane/Et<sub>2</sub>O 6:1) to give 0.7 g of 1-cyclooct-2-enylethanone (55%).

15  $^{13}\text{C}$ -NMR (100MHz,  $\text{CDCl}_3$ ):  $\delta$  25.20 (t), 26.41 (t), 26.58 (t), 28.73 (q), 29.14 (t), 31.77 (t), 50.38 (d), 127.40 (d), 131.83 (d), 210.52 (s, CO). MS (EI): 152 (14), 137 (4), 134 (5), 124 (3), 110 (4), 109 (31), 95 (18), 94 (10), 81 (20), 79 (21), 67 (98), 55 (29), 43 (100), 39 (22).

Odour description: green, thuja oil, wormwood, fruity.

20

#### Example 7: 1-Cyclooct-1-enylethanone

At 35°C, a solution of lithium acetylide-ethylene diamine (50 g, 0.49 mol) in THF (500 ml) was slowly treated (reaction temperature  $\leq 35^\circ\text{C}$ ) with a solution of cyclooctanone (51.4 g, 0.41 mol) in THF (100 ml). The resulting mixture was stirred for 4 h at 20°C, 15h at 45°C, cooled to 5°C, treated with aqueous sat.  $\text{NH}_4\text{Cl}$  solution (250 ml) and washed with 3M aqueous HCl. After extraction with Et<sub>2</sub>O, the organic phases were washed with water, aqueous sat.  $\text{Na}_2\text{CO}_3$  solution, dried ( $\text{Na}_2\text{SO}_4$ ), and concentrated to give 1-ethynylcyclooctanol (66.6 g). A solution of crude 1-ethynylcyclooctanol (65 g) in formic acid (130 ml) was heated for 2.5 h at 80°C. The resulting mixture was taken up in Et<sub>2</sub>O and washed successively with water, 5M NaOH, water, aqueous sat.  $\text{NH}_4\text{Cl}$  solution, dried ( $\text{Na}_2\text{SO}_4$ ), and concentrated to give 56 g of crude product. A fraction (8 g) was purified by flash chromatography (hexane/Et<sub>2</sub>O 95:5→ 9:1) to give 4.1 g of 1-cyclooct-2-enylethanone.

MS (EI): 152 (43), 137 (31), 123 (15), 109 (48), 81 (21), 67 (67), 55 (23), 43 (100).

Odour description: fruity, sweet, anisic, minty, terpineol, camphoraceous.

5 Example 8: 1-Cyclooctylpropanone

A solution of 1-cyclooct-3-enylpropan-1-one (1.5 g, 9 mmol) in ethanol (20 ml) was treated with 10% palladium on charcoal (0.09 g) at room temperature and the resulting suspension was hydrogenated during 40 min. at 20 bars. After filtration through Celite® and concentration under vacuum, the crude product was purified by flash  
10 chromatography (hexane/Et<sub>2</sub>O 19:1) to give 0.78 g of 1-cyclooctylpropanone (52%).

<sup>13</sup>C-NMR (100MHz, CDCl<sub>3</sub>): δ 8.06 (q), 25.54 (t, 2 CH<sub>2</sub>), 26.28 (t), 26.60 (t, 2 CH<sub>2</sub>), 28.16 (t, 2 CH<sub>2</sub>), 33.95 (t), 50.47 (d), 215.15 (s, CO). MS (EI): 168 (3), 139 (17), 111 (47), 69 (100), 55 (55), 41 (45), 29 (34).

15

Odour description: fruity, green.

Example 9: 1-Cyclooctylethanone

Obtained according to the synthetic procedure of Example 8 from of 1-cyclooct-3-enylethanone in 49% yield. Boiling point 154°C/120 mbar.  
20

<sup>13</sup>C-NMR (100MHz, CDCl<sub>3</sub>): δ 25.47 (t, 2 CH<sub>2</sub>), 26.24 (t), 26.60 (t, 2 CH<sub>2</sub>), 27.94 (t, 2 CH<sub>2</sub>), 28.01 (q), 51.54 (d). MS (EI): 154 (4), 139 (3), 125 (6), 111 (18), 96 (19), 81 (10), 69 (100), 55 (58), 43 (66), 39 (19).

25

Odour description: agrestic, camphoraceous, armoise, thujone-like, earthy, woody.

Example 10: 1-Cyclooctyl-2-methylpropanone

A solution of 1-cyclooct-3-enyl-2-methylpropanone (5.0 g, 28 mmol) in ethanol (50 ml) was treated with 10% palladium on charcoal (0.2 g) at room temperature and the resulting suspension was hydrogenated during 60 min. at 20 bars. After filtration through Celite® and concentration under vacuum, the crude product was purified by flash chromatography (hexane/Et<sub>2</sub>O 19:1) to give 0.9 g of 1-cyclooctyl-2-methylpropanone (43%).  
30

<sup>13</sup>C-NMR (100MHz, CDCl<sub>3</sub>): δ 18.59 (q, 2 Me), 25.56 (t, 2 CH<sub>2</sub>), 26.34 (t), 26.55 (t, 2 CH<sub>2</sub>), 28.30 (t, 2 CH<sub>2</sub>), 39.28 (d), 48.71 (d), 218.26 (s, CO). MS (EI): 182 (5), 167 (1), 153 (1), 139 (16), 111 (66), 69 (100), 55 (41), 43 (39), 41 (39).

5

Odour description: floral, fruity, balsamic.

**Example 11: 1-Cyclooctyl-2-methylpropanol**

A suspension of sodium borohydride (0.29 g, 8 mmol) in methanol (30 ml) was treated  
 10 with a solution of 1-cyclooctyl-2-methylpropanone (2.0 g, 11 mmol) in methanol (20 ml)  
 at room temperature. The resulting mixture was stirred at 20°C during 20 h, poured over  
 2 M aqueous HCl (50 ml) and extracted with MTBE (2 x 80 ml). The organic phases  
 were washed with water (100 ml), aqueous sat. NaCl solution (100 ml), and dried  
 (MgSO<sub>4</sub>). The crude product was purified by flash chromatography (hexane/Et<sub>2</sub>O 7:1) to  
 15 give 1.7 g of 1-cyclooctyl-2-methylpropanol (81%).

<sup>13</sup>C-NMR (100MHz, CDCl<sub>3</sub>): δ 17.41 (q), 19.93 (q), 25.68 (t), 26.25 (t), 26.34 (t), 26.68  
 (t), 26.77 (t), 27.03 (t), 30.32 (d), 31.12 (t), 39.25 (d), 82.35 (d). MS (EI): 183 (1), 166  
 (1), 141 (14), 123 (33), 110 (11), 95 (12), 81 (59), 73 (100), 69 (31), 55 (63), 41 (41).

20

Odour description: floral, woody, rosy, fruity.

**Example 12: A fragrance composition for a soap :**

25	<u>compound/ingredient</u>	<u>parts by weight 1/1000</u>
	Civette GIVCO 208*	1
	Ethyl vanilline	1
	cis-Jasmone	1
	Castoreum GIVCO 116*	2
30	Galbanum GIVCO 121*	2
	Aldehyde C11 Undecylic	3
	Cyclal C	3
	Petitgrain essential oil Paraguay	3
	Iso Butyl Quinoleine (at 10% in DPG)	3

	Evernyl	4
	Dimethyl Anthranilate	4
	Givescone	5
	Dimethyl Octenone	6
5	Labienoxime (1%/CQS)	6
	Tangerinol	6
	Sandalwood GIVCO 203*	6
	Florhydral	7
	Allyl Amyl Glycolate	8
10	Romarin essential oil	8
	Velvione	10
	Coumarin	10
	Okoumal	10
	Thibetolide	10
15	Oxyoctaline Formate	15
	Isoraldeine 95	15
	Gaiacwood essential oil	20
	Lemon essential oil California	20
	Patchouli essential oil	20
20	Amyl Salicylate	20
	Benzyl Acetate	30
	Geranodyle	35
	Citronellol	40
	Lavandin Grosso essential oil	50
25	Alpha Hexyl Cinnamic Aldehyde	80
	Dihydro Myrcenol	130
	Bergamote GIVCO 104*	200
	Dipropylene Glycol	203
	Compound of formula I	3
30		<hr/>
		1000

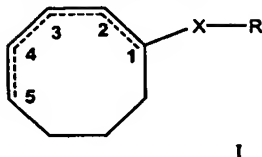
\*Fragrance Ingredients Index 2002. Givaudan S. A.

- 5 A) Adding 1-cyclooct-3-enylethanone to the fragrance composition significantly increases the diffusion of the whole fragrance, offering a better base coverage of the soap. 1-cyclooct-3-enylethanone adds a sophisticated agrestic note in the range of armoise oil, with ozonic, cucumber undertones. It also imparts more volume to the woody accord.
- 10 B) Adding a mixture of 1-cyclooct-3-enylethanone, 1-cyclooct-3-enylethanone, and 1-cyclooct-3-enylethanone in the ratio of about 60:30:10 parts by weight to the fragrance composition imparts less sweet and more fresh, agrestic notes in the range of armoise oil / wormwood with similar strength and enhanced diffusivity compared to Example B.



## Claims

1. The use of a compound of formula I as a fragrance,



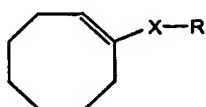
wherein X is carbonyl, or  $-(CHOH)-$ ; and

R is methyl or ethyl, or linear or branched  $C_3$  to  $C_5$  alkyl; or

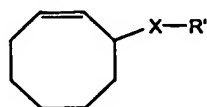
R is vinyl or linear or branched  $C_3$  to  $C_5$  alkenyl; and

the dotted line represents one optional double bond.

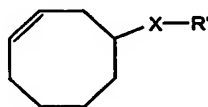
2. The use of a compound according to claim 1 selected from 1-cyclooct-3-enylethanone, 1-cyclooct-3-enylpropan-1-one, 1-cyclooct-3-enyl-2-methylpropan-1-one, 1-cyclooct-3-enylpropan-1-ol, 1-cyclooct-4-enylethanone, 1-cyclooct-2-enylethanone, 1-cyclooct-2-enylethanol, 1-cyclooct-1-enylethanone, 1-cyclooctylpropanone, 1-cyclooctylethanone, 1-cyclooctyl-2-methylpropanone, and 1-cyclooctyl-2-methylpropanol.
3. The use of a compound as defined in one of the preceding claims in fragrance applications.
4. A fragrance application comprising a compound as defined in any of the claims 1 or 2, or a mixture thereof.
5. A fragrance application according to claim 4 wherein the fragrance application is a perfume, household product, laundry product, body care product or cosmetic.
6. A fragrance composition comprising a mixture of
- A) a compound of formula Ic; and
- B) at least one compound selected from a compound of formula Ia, Ib, and Id



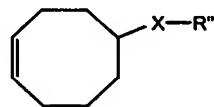
Ia



Ib



Ic



Id

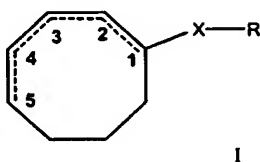
wherein X is carbonyl, or  $-(CHOH)-$  ; and

R is methyl or ethyl, or linear or branched  $C_3$  to  $C_5$  alkyl; or

R is vinyl or linear or branched  $C_3$  to  $C_5$  alkenyl;

and  $R = R' = R'' = R'''$  and  $X = X' = X'' = X'''$ .

7. A method of manufacturing a fragrance application, comprising the step of incorporating a compound of formula I as defined in claim 1.
8. A compound of formula I



wherein X is carbonyl, or  $-(CHOH)-$  ; and

R is methyl or ethyl, or linear or branched  $C_3$  to  $C_5$  alkyl; or

R is vinyl or linear or branched  $C_3$  to  $C_5$  alkenyl; and

the dotted line represents one optional double bond;

provided that

when X is carbonyl and one of the bond between C-1 and C-2, C-2 and C-3, and C-3 and C-4 together with the dotted line is a double bond, R is not methyl or ethyl;

when X is carbonyl and the bond between C-2 and C-3 together with the dotted line is a double bond, R is not *i*-propyl;

when X is carbonyl and the bond between C-3 and C-4 together with the dotted line is a double bond, R is not methyl or ethyl;

when X is carbonyl and all of the bonds between C-1 and C-2, C-2 and C-3, C-3 and C-4, and C-4 and C-5 together with the dotted line represent each a single bond, R is not methyl or ethyl;

when X is  $-(CHOH)-$  , R is not methyl; and

when X is  $-(CHOH)-$  and the bond between C-2 and C-3 together with the dotted line is a double bond, R is not ethyl.

9. A compound selected from 1-cyclooct-3-enyl-2-methylpropan-1-one, 1-cyclooct-3-enylpropan-1-ol, 1-cyclooct-4-enylethanone, 1-cyclooctyl-2-methylpropanone, and 1-cyclooctyl-2-methylpropanol.

## INTERNATIONAL SEARCH REPORT

International Classification No.  
PCT/CH 03/00660

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 A61K7/46 C11B9/00 C07C31/133 C07C33/16 C07C49/307  
C07C49/547

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 A61K C11B C07C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, PAJ, WPI Data, CHEM ABS Data, BIOSIS, EMBASE

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DIXON J.R., ET AL.: "Mass Spectral Data of Cyclooctyl Derivatives" JOURNAL OF CHEMICAL AND ENGINEERING DATA, vol. 20, no. 1, pages 123-124, XP001157123	4,5
A	the whole document	1-3,6-9
A	WO 99 51713 A (COGNIS DEUTSCHLAND GMBH ;MARKERT THOMAS (DE); PORRMANN VOLKER (DE)) 14 October 1999 (1999-10-14) cited in the application claims 1-6	1-9
A	US 4 214 098 A (DE JONG AALDERT J ET AL) 22 July 1980 (1980-07-22) column 1, line 33-60	1-9
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☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

12 January 2004

Date of mailing of the international search report

03/02/2004

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Lindner, A

# INTERNATIONAL SEARCH REPORT

International Patent No.  
PCT/CH 00660

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Information on patent family members

International Application No

PCT/CH 05/00660

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